

Report No. 55 of the Director of Audit — Chapter 8

MANAGING AND REDUCING WATER MAIN BURSTS AND LEAKS

Summary

1. The Water Supplies Department (WSD) is responsible for supplying fresh water and salt water (seawater for flushing) in Hong Kong. As of April 2010, there were about 7,800 kilometres (km) of water mains in the water supply and distribution systems, most of which were laid underground. In the early 1990s, the WSD noted that a substantial portion of water mains were approaching the end of their service lives. Ageing water mains are prone to bursts and leaks, resulting in water loss, disrupting water supply and causing inconvenience to the public. The Audit Commission (Audit) has recently conducted a review to examine the WSD's management of bursts and leaks in the water supply and distribution systems.

Repair of burst and leak water mains

2. The WSD deploys both in-house staff and term contractors to carry out emergency repairs of water mains. The objective of taking immediate action on a water main burst is to minimise the impacts on water supply to users.

3. *Need to promptly notify term contractors to arrive at main burst sites.* According to WSD guidelines, upon receipt of a report of a main burst, the responsible term contractor should be notified to proceed to the site without delay. In 146 (15%) of 969 main burst cases in 2009-10, the term contractors were notified between 31 minutes and one hour after WSD turncock gangs' arrival at the sites. In another 75 cases (8%), the time taken was more than one hour. Furthermore, WSD staff did not document the justifications for not promptly notifying the term contractors. *Audit has recommended that the Director of Water Supplies should take measures to ensure that WSD staff promptly notify term contractors to arrive at main burst sites, and document the justifications for not doing so.*

4. *Need to ensure sufficient emergency team members on site.* According to the term contracts, a term contractor should make available at any hour of a day or night the stipulated number of emergency teams, each with a minimum of ten members. However, the contracts do not specify the minimum number of emergency team members to attend to main bursts on site. In 2009-10, of the 582 main burst cases where less than ten emergency team members took part in the repair works, the time of supply interruption (TSI — the time between the isolation of a burst main and the resumption of water supply) of 243 (42%)

cases was more than seven hours. *Audit has recommended that the Director of Water Supplies should: (a) consider specifying in term contracts the minimum number of emergency team members for attending to various types of main bursts; and (b) take measures to ensure that term contractors provide sufficient staff for completing repairs of burst water mains as soon as practicable.*

5. ***Room for improvement in road reinstatement works.*** After completion of water main repair works, a term contractor needs to submit a Completion Notice to the Highways Department (HyD) for acceptance of the backfilling and reinstatement works. If such works are not accepted by the HyD, the contractor needs to carry out improvement works. As of March 2010, there were still 296 outstanding road reinstatement cases, 71 of which related to water main repairs completed between 2005 and 2008. *Audit has recommended that the Director of Water Supplies should: (a) step up efforts to ensure that term contractors carry out road reinstatement works promptly and effectively; and (b) expedite action on completing the long-outstanding works.*

6. ***Room for improvement in handling non-compliance cases.*** For each burst case with TSI exceeding seven hours, the WSD compiled a non-compliance case report. In 2009-10, the WSD compiled 75 such case reports. An audit examination of four cases (with TSI exceeding 15 hours) revealed that sufficient reasons were not provided in the case reports for justifying the long time taken to complete the repair works. *Audit has recommended that the Director of Water Supplies should consider: (a) conducting investigations and compiling detailed reports on serious non-compliance cases; and (b) publicising details of each main burst case on the WSD website.*

7. ***Need to monitor performance on provision of emergency water supply.*** According to the WSD's internal performance target, if there is a need to provide emergency water supply, such service should be provided within three hours after isolation of water mains for 90% of these cases. However, the WSD did not maintain statistics on the time taken for the provision of such service. *Audit has recommended that the Director of Water Supplies should maintain statistics for monitoring the achievement of the target for providing emergency water supply, and consider including the target in the WSD performance pledge.*

8. ***Need to monitor performance on water main leak cases.*** In 4,093 (31%) of 13,038 leak cases for 2009-10, the WSD took more than six hours to isolate the water mains after receiving notification. In one case, the WSD isolated the water main 16 hours and 30 minutes after receiving notification and a water loss of 20,500 cubic metres was recorded. *Audit has recommended that the Director of Water Supplies should: (a) endeavour to take prompt actions on water main leak cases; (b) document the reasons for taking a long time to isolate leak water mains; and (c) consider setting performance targets for isolation of leak water mains.*

9. ***Need to address external disturbances causing water main bursts.*** Between 2007-08 and 2009-10, 2,225 (54%) of 4,128 burst cases were caused by external disturbances, such as ground settlement or vibration. *Audit has recommended that the Director of Water Supplies should remind WSD staff to ascertain the underlying reasons for water main bursts caused by external disturbances, and take appropriate follow-up action.*

Implementation of Replacement and Rehabilitation Programme

10. In 1997, the WSD formulated a Replacement and Rehabilitation (R&R) Programme to replace and rehabilitate some 3,000 km of aged water mains from 2000 to 2020. In January 2005, to bring earlier improvements, the WSD revised the R&R Programme to advance the completion date from 2020 to 2015. Up to March 2010, the WSD had completed replacing and rehabilitating 41% of the water mains. As a result of the R&R Programme and other WSD initiatives, the water main leakage rate was reduced from 25% in 2000 to 21% in 2009.

11. ***Need to meet scheduled completion time.*** Of the 1,225 km of water mains replaced and rehabilitated, 21% were completed in the first six years of the R&R Programme from 2001 to 2006. From 2007 to 2009, the WSD accelerated the replacement and rehabilitation works. As at 31 March 2010, 59% of the total 3,000 km of water mains had yet to be replaced or rehabilitated. *Audit has recommended that the Director of Water Supplies should: (a) keep up the efforts in replacing and rehabilitating water mains to ensure that the R&R Programme is completed by 2015 as scheduled; and (b) consider distributing more evenly the workload over the implementation period of a water main replacement and rehabilitation programme in future.*

12. ***Need to ensure early completion of works.*** Audit's examination of four completed contracts revealed that, for 47% of the works orders, the completion dates were later than their scheduled completion dates. Extensions of time were granted by the WSD for some of such works orders due to changes in works requirements and long time taken for obtaining approval of temporary traffic arrangements. *Audit has recommended that the Director of Water Supplies should take measures to minimise the time required for agreeing on works requirements and temporary traffic arrangements with the government departments and related parties concerned.*

13. ***Need to remove abandoned underground water mains.*** At present, the WSD would not remove obsolete water mains for disposal after completing the replacement works. In Audit's view, keeping abandoned water mains underground may aggravate the congestion of utilities in some areas and affect excavation and underground works. *Audit has recommended that the Director of Water Supplies should remove abandoned underground water mains whenever opportunities arise in future, particularly in urban areas with congested underground utilities.*

14. ***Need to plan for another replacement and rehabilitation programme.*** Some bursts and leaks involving ageing water mains had not been covered in the current R&R Programme. *Audit has recommended that the Director of Water Supplies should commence planning for another programme for replacing and rehabilitating ageing water mains not covered in the current programme.*

Management of water pressure

15. As fresh water is distributed to users by gravity through extensive networks of water mains in the 17 fresh water supply zones, water within the water mains is under pressure which is dependent on the altitude of the locations and their distance from service reservoirs. To ensure sufficient pressure for water supply, the WSD has set a performance pledge of maintaining a minimum water pressure of between 15-metre head and 30-metre head. On average, the fresh water supply pressure in Hong Kong is between 60-metre head and 80-metre head. High water pressure may cause water main bursts and leaks. Since 1997, the WSD has implemented pressure management schemes (PMS) in selected areas to reduce the water pressure. The implementation of the PMS, involving planning and design (PMS studies) and installation of pressure reducing valves (PMS works), helps reduce water losses and lower water consumption.

16. ***Need to complete PMS studies as early as practicable.*** In January 2003, the WSD commenced PMS studies for fresh water supply zones. Up to August 2010, the studies for 12 supply zones had either been completed or in progress, and studies for five supply zones had not commenced. *Audit has recommended that the Director of Water Supplies should complete the PMS studies as early as practicable.*

17. ***Need to complete PMS works as early as practicable.*** For the supply zones for which the PMS studies had been completed, the WSD scheduled to complete the PMS works between January 2011 and March 2014 (30 to 96 months after completion of the studies). Up to March 2010, of the 213 pressure management areas covered in the studies, the WSD had completed works for 32 areas. *Given the substantial benefits that can be achieved, Audit has recommended that the Director of Water Supplies should: (a) take measures to complete the PMS works as early as practicable in supply zones with PMS studies completed; (b) formulate an action plan with target completion dates for monitoring the PMS works; and (c) accord high priority to implementing the PMS for areas with exceptionally high water pressure.*

Leakage in fresh water distribution systems of residential developments

18. Since 2003, the WSD has installed bulk meters outside the boundaries of selected residential developments to monitor fresh water consumption. Unmetered water (i.e. water not metered nor charged) is a shortfall in the quantity of water between that recorded by the bulk meters and that by the household meters. The WSD periodically monitors the amount of unmetered water in selected developments and would require the

estate managements to carry out repair works if leakage is identified. Up to August 2010, 44 developments (20 private estates and 24 public estates) had been installed with bulk meters.

19. In late 2005, the WSD planned to implement a master metering policy (MMP) in two stages by installing master meters inside residential developments. After ascertaining the quantity of unmetered water, the WSD would examine the need for levying charges on unmetered water. In January 2006, Stage 1 of the MMP (for new developments) commenced. Stage 2 (for existing developments with not less than 1,000 households) was planned to commence in January 2012 for completion by 2022.

20. *Need to take effective measures to reduce inside service leakage.* According to the WSD's estimate, in 2009, the quantity of unmetered water through leakage in the water distribution systems of residential developments (inside services) was 17.63 million cubic metres. As of March 2010, in 9 residential developments installed with bulk meters, unmetered water ranged from 20% to 74% of the water supplied to the developments. As unmetered water is not charged, some estate managements may not have the incentive to rectify inside service leakage in a timely and effective manner. *Audit has recommended that the Director of Water Supplies should: (a) review the existing strategy for minimising fresh water losses in inside services of private fresh water distribution systems in residential developments; and (b) explore measures to ensure that leak inside services are repaired in a timely and satisfactory manner.*

21. *Need to monitor unmetered water in new residential developments.* Up to April 2010, master meters had been installed in all the 20 new residential developments under Stage 1 of the MMP. However, no readings for such master meters had been taken. *Audit has recommended that the Director of Water Supplies should monitor unmetered fresh water in new residential developments installed with master meters.*

22. *Need to promote public awareness on repairing inside services.* The WSD has published leaflets and produced Announcements in Public Interest to inform the public of their responsibilities for maintaining and repairing leak inside services in residential developments. In view of the inside service leakage problem, the WSD needs to enhance publicity efforts. *Audit has recommended that the Director of Water Supplies should launch publicity campaigns to promote public awareness of the importance of proper maintenance of inside services in residential developments.*

Response from the Administration

23. The Administration agrees with the audit recommendations.

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